	1	2	3	4	5
Application Number	60-105650(1985)				
Unexamined Publication Number	JP,62-014897,U1(1987)				
Examined Publication Number	**JP,07-031664,Y(1995)**				
Registration Number	JP,2108532,Y				

CLAIMS

[Claims]
[Claim 1]A loudspeaker device which has a diaphragm driven with an audible signal, comprising:
A tabular piezoelectric device which has the 1st and 2nd electrodes that detect vibration on the upper surface and the undersurface.
A printed circuit board attached to the upper part of a bobbin where the 1st and 2nd circuit patterns electrically connected with the 1st and 2nd electrodes of the above were formed on the same flat surface, and the above-mentioned diaphragm was combined.

A conductive elastic member which is provided so that it may be pinched by this printed circuit board and the above-mentioned piezoelectric device, and electrically connects the 1st circuit pattern of the above-mentioned printed circuit board, and the 2nd electrode of the above-mentioned piezoelectric device.
A piezoelectric detecting element which consists of a metallic pressing piece to which the other end is soldered by the 2nd circuit pattern of the above-mentioned printed circuit board where one end is welded by pressure to the 1st electrode of the above-mentioned piezoelectric device.

DETAILED DESCRIPTION

[Detailed explanation of the device]
[Industrial Application]
This device is concerned with a loudspeaker device and related with a loudspeaker device provided with the piezoelectric detecting element which detects especially vibration of a loudspeaker.
[The outline of a device]
Since the loudspeaker device of this device is constituted so that conductive rubber may

be laid on the printed circuit board attached to the bobbin upper part of a loudspeaker, the end of a piezoelectric device may be carried on it and it may fix with a metallic pressing piece, The lead for pulling out the vibration output signal of a loudspeaker and soldering work become unnecessary, and do not get worse the oscillation characteristic of a piezoelectric device. The output characteristics of a loudspeaker can be prevented from changing with soldering.

[Description of the Prior Art]

There are what uses as a detection sensor the coil set in electromagnetic field as a sensor which detects vibration of a loudspeaker etc., and a thing which uses as a sensor the piezoelectric device which changes into an electrical signal distortion of the substance by which it is generated by vibration.

Since magnetic structure is needed for the candy which forms the magnetic field interlinked with a coil, the former has the fault that a miniaturization is difficult and structure is complicated, but since structure becomes comparatively easy, the latter thing can be used as a sensor comparatively easily.

Fig. 3 shows one working example which uses this piezoelectric device as oscillating detection of a loudspeaker, a permanent magnet and 12 are the yokes of doughnut shape, and the yoke from which 10 constitutes a magnetic circuit, and 11 confront each other via the pole piece 13 and the small magnetic gap. The bobbin by which 14 is inserted in this magnetic gap, the voice coil in which 15 is wound around the bobbin 14 about, the damper in which 16 is supporting the bobbin 14 elastically, and 17 are the diaphragms (corn) combined with the bobbin 14, The peripheral side of this diaphragm 17 is combined with the loudspeaker frame 19 via the free edge 18.

In the dome part of the diaphragm 17, in order to perform oscillating detection of the vibration 17, the piezoelectric device 20 is attached.

This piezoelectric device 20 is being fixed to the top opening of said bobbin 14 by the support components 21 and 21 which those both ends become from a rubber material etc. like a graphic display. And the leads 23 and 23 are connected to the electrode surface of the upper and the bottom by the solder 22 and 22.

Such a loudspeaker is generally called the MFB (motional feedback) loudspeaker, and controls the oscillation characteristic of a loudspeaker by feeding back the vibration output of said piezoelectric device 20 to an amplifier.

That is, if the diaphragm 17 vibrates with the audible signal passed to the voice coil 15, the piezoelectric device 20 by which both ends are supported by the support components 21 and 21 will be excited by the diaphragm 17, and will serve as flexing vibration. Therefore, since the voltage proportional to vibration of the diaphragm 17 is outputted via the leads 23 and 23, if negative feedback of this signal is carried out to the amplifier for the drive of a loudspeaker, a nonlinear machine signal will be oppressed.

[The problem which a device tends to solve]

However, if the character frequency f_0 will fall since a soldering portion increases the mass of the piezoelectric device 20 if the leads 23 and 23 are soldered to the piezoelectric device 20, and character frequency f_0 approaches an audible frequency range, a different oscillating posture from vibration of the diaphragm 17 will occur.

Then, by the piezoelectric device 20, it becomes impossible to detect vibration of the diaphragm 17 faithfully, and good motional feedback control is not performed.

Since the detecting characteristic of the piezoelectric device 20 changes with quantity of

soldering, such a MFB loudspeaker device has the problem that variation occurs for every loudspeaker.
This device was made in order to cancel this problem, and it provides the loudspeaker device it enabled it to output without basing the detecting signal of a piezoelectric device on soldering work.
[Means for Solving the Problem]
In a loudspeaker device which has a diaphragm which this device drives with an audible signal, A tabular piezoelectric device which has the 1st and 2nd electrodes that detect vibration on the upper surface and the undersurface, A printed circuit board attached to the upper part of a bobbin where the 1st and 2nd circuit patterns electrically connected with the 1st and 2nd electrodes of the above were formed on the same flat surface, and the above-mentioned diaphragm was combined, A conductive elastic member which is provided so that it may be pinched by this printed circuit board and the above-mentioned piezoelectric device, and electrically connects the 1st circuit pattern of the above-mentioned printed circuit board, and the 2nd electrode of the above-mentioned piezoelectric device, Where one end is welded by pressure to the 1st electrode of the above-mentioned piezoelectric device, the other end provides a piezoelectric detecting element which consists of a metallic pressing piece soldered to the 2nd circuit pattern of the above-mentioned printed circuit board.
[Function]
Since the piezoelectric device is being fixed on the printed circuit board in the state where it was fastened with conductive rubber and a pressing piece, the oscillating voltage outputted from the upper surface electrode and undersurface electrode of a piezoelectric device is connected to the circuit pattern of a printed circuit board via conductive rubber and a metallic pressing piece. Therefore, where the peculiar oscillation characteristic of a piezoelectric device is maintained, the vibration output of a loudspeaker can be taken out now.
[Example]
Fig. 1 is a side view showing the oscillating primary detecting element of a loudspeaker which shows the principal part of this device, and an overall structure of the loudspeaker device shown in Fig. 3 is omitted.
In this figure, the printed circuit board by which 1 is provided in the bobbin upper part of the loudspeaker, 2a, and 2b are the circuit patterns currently formed in the printed circuit board 1, and are formed in accordance with the outside of a piezoelectric device.
3 is the conductive rubber arranged on the circuit pattern 2a, and that [its] by which the conductive fiber is mixed in the sliding direction, for example is preferred. On the surface, 4 and 5 are the piezoelectric-crystal boards with which an upper surface electrode and the undersurface electrodes 6 and 7 are constituted, and are used as the piezoelectric device of bimorph structure by vacuum evaporation or plating via the central electrode board 8. 9 and 9 are the pressing pieces constituted by metallicity, for example, brass etc., and the end is soldered to said circuit pattern 2b and 2b.
The structure of the piezoelectric device with which the loudspeaker device of this design is equipped, Since it is constituted as mentioned above, in the composed stage, the undersurface electrode 6 of a piezoelectric device will electrically be connected to the circuit patterns 2a and 2a via the conductive rubbers 3 and 3, and the upper surface electrode 7 will electrically be connected to circuit pattern 2b and 2b via the pressing

pieces 9 and 9.
Therefore, by soldering a lead to the circuit patterns 2a and 2a, or extending the circuit pattern 2a and 2b, as illustrated, Although not illustrated, it is connectable with the head amplifier circuit currently formed on this printed circuit board, and as shown in above mentioned Fig. 3, it can attach to the upper surface of the bobbin 14, and the vibration output of a loudspeaker can be taken out.
Since the piezoelectric device is forced on the conductive rubbers 3 and 3 with the pressing pieces 9 and 9, it is as [this] fixable enough, but fixing firmly with adhesives etc. further is preferred.
Fig. 2 shows other working examples of the fixing structure of the piezoelectric device of this device, and Fig. 1 and identical codes show identical parts.
In the case of this working example, the circuit pattern 2a and 2b are formed so that it may conduct mutually, and electric connection is made by another circuit pattern 2c via the short lead from the bipolar electrode 8.
Therefore, since the electrode surface of the upper and [of a piezoelectric device] the bottom will serve as ground potential if the circuit pattern 2a and 2b are used as a grounding terminal, a shielding effect can be brought to the whole piezoelectric device and the effect of not gathering an inductive noise can be done so.
[Effect of the Device]
As explained above, the loudspeaker device of this device, Since it constituted so that the upper surface of the voice coil bobbin of a loudspeaker might be used as a printed circuit board and a piezoelectric device might be fixed on a printed circuit board with conductive rubber and a pressing piece, the soldering work for outputting oscillating voltage becomes unnecessary, and it is effective in not checking the oscillation characteristic of a piezoelectric device.
Since a printed circuit board can draw out the vibration output of a loudspeaker, also when fixing structure becomes easy and a piezoelectric transducer is attached to a loudspeaker etc., it has the advantage of not generating an allophone.

TECHNICAL FIELD

[Industrial Application]
This device is concerned with a loudspeaker device and related with a loudspeaker device provided with the piezoelectric detecting element which detects especially vibration of a loudspeaker.
[The outline of a device]
Since the loudspeaker device of this device is constituted so that conductive rubber may be laid on the printed circuit board attached to the bobbin upper part of a loudspeaker, the end of a piezoelectric device may be carried on it and it may fix with a metallic pressing piece, The lead for pulling out the vibration output signal of a loudspeaker and soldering work become unnecessary, and do not get worse the oscillation characteristic of a piezoelectric device. The output characteristics of a loudspeaker can be prevented from changing with soldering.

PRIOR ART

[Description of the Prior Art]
There are what uses as a detection sensor the coil set in electromagnetic field as a sensor which detects vibration of a loudspeaker etc., and a thing which uses as a sensor the piezoelectric device which changes into an electrical signal distortion of the substance by which it is generated by vibration.
Since magnetic structure is needed for the candy which forms the magnetic field interlinked with a coil, the former has the fault that a miniaturization is difficult and structure is complicated, but since structure becomes comparatively easy, the latter thing can be used as a sensor comparatively easily.
Fig. 3 shows one working example which uses this piezoelectric device as oscillating detection of a loudspeaker, a permanent magnet and 12 are the yokes of doughnut shape, and the yoke from which 10 constitutes a magnetic circuit, and 11 confront each other via the pole piece 13 and the small magnetic gap. The bobbin by which 14 is inserted in this magnetic gap, the voice coil in which 15 is wound around the bobbin 14 about, the damper in which 16 is supporting the bobbin 14 elastically, and 17 are the diaphragms (corn) combined with the bobbin 14, The peripheral side of this diaphragm 17 is combined with the loudspeaker frame 19 via the free edge 18.
In the dome part of the diaphragm 17, in order to perform oscillating detection of the vibration 17, the piezoelectric device 20 is attached.
This piezoelectric device 20 is being fixed to the top opening of said bobbin 14 by the support components 21 and 21 which those both ends become from a rubber material etc. like a graphic display. And the leads 23 and 23 are connected to the electrode surface of the upper and the bottom by the solder 22 and 22.
Such a loudspeaker is generally called the MFB (motional feedback) loudspeaker, and controls the oscillation characteristic of a loudspeaker by feeding back the vibration output of said piezoelectric device 20 to an amplifier.
That is, if the diaphragm 17 vibrates with the audible signal passed to the voice coil 15, the piezoelectric device 20 by which both ends are supported by the support components 21 and 21 will be excited by the diaphragm 17, and will serve as flexing vibration.
Therefore, since the voltage proportional to vibration of the diaphragm 17 is outputted via the leads 23 and 23, if negative feedback of this signal is carried out to the amplifier for the drive of a loudspeaker, a nonlinear machine signal will be oppressed.

EFFECT OF THE INVENTION

[Effect of the Device]
As explained above, the loudspeaker device of this device, Since it constituted so that the upper surface of the voice coil bobbin of a loudspeaker might be used as a printed circuit board and a piezoelectric device might be fixed on a printed circuit board with conductive rubber and a pressing piece, the soldering work for outputting oscillating voltage becomes unnecessary, and it is effective in not checking the oscillation characteristic of a piezoelectric device.
Since a printed circuit board can draw out the vibration output of a loudspeaker, also

when fixing structure becomes easy and a piezoelectric transducer is attached to a loudspeaker etc., it has the advantage of not generating an allophone.

TECHNICAL PROBLEM

[The problem which a device tends to solve]
However, if the character frequency f_0 will fall since a soldering portion increases the mass of the piezoelectric device 20 if the leads 23 and 23 are soldered to the piezoelectric device 20, and character frequency f_0 approaches an audible frequency range, a different oscillating posture from vibration of the diaphragm 17 will occur.
Then, by the piezoelectric device 20, it becomes impossible to detect vibration of the diaphragm 17 faithfully, and good motional feedback control is not performed.
Since the detecting characteristic of the piezoelectric device 20 changes with quantity of soldering, such a MFB loudspeaker device has the problem that variation occurs for every loudspeaker.
This device was made in order to cancel this problem, and it provides the loudspeaker device it enabled it to output without basing the detecting signal of a piezoelectric device on soldering work.

MEANS

[Means for Solving the Problem]
In a loudspeaker device which has a diaphragm which this device drives with an audible signal, A tabular piezoelectric device which has the 1st and 2nd electrodes that detect vibration on the upper surface and the undersurface, A printed circuit board attached to the upper part of a bobbin where the 1st and 2nd circuit patterns electrically connected with the 1st and 2nd electrodes of the above were formed on the same flat surface, and the above-mentioned diaphragm was combined, A conductive elastic member which is provided so that it may be pinched by this printed circuit board and the above-mentioned piezoelectric device, and electrically connects the 1st circuit pattern of the above-mentioned printed circuit board, and the 2nd electrode of the above-mentioned piezoelectric device, Where one end is welded by pressure to the 1st electrode of the above-mentioned piezoelectric device, the other end provides a piezoelectric detecting element which consists of a metallic pressing piece soldered to the 2nd circuit pattern of the above-mentioned printed circuit board.

OPERATION

[Function]
Since the piezoelectric device is being fixed on the printed circuit board in the state where it was fastened with conductive rubber and a pressing piece, the oscillating voltage outputted from the upper surface electrode and undersurface electrode of a piezoelectric device is connected to the circuit pattern of a printed circuit board via conductive rubber and a metallic pressing piece. Therefore, where the peculiar oscillation characteristic of a piezoelectric device is maintained, the vibration output of a loudspeaker can be taken out now.

EXAMPLE

[Example]
Fig. 1 is a side view showing the oscillating primary detecting element of a loudspeaker which shows the principal part of this device, and an overall structure of the loudspeaker device shown in Fig. 3 is omitted.
In this figure, the printed circuit board by which 1 is provided in the bobbin upper part of the loudspeaker, 2a, and 2b are the circuit patterns currently formed in the printed circuit board 1, and are formed in accordance with the outside of a piezoelectric device.
3 is the conductive rubber arranged on the circuit pattern 2a, and that [its] by which the conductive fiber is mixed in the sliding direction, for example is preferred. On the surface, 4 and 5 are the piezoelectric-crystal boards with which an upper surface electrode and the undersurface electrodes 6 and 7 are constituted, and are used as the piezoelectric device of bimorph structure by vacuum evaporation or plating via the central electrode board 8.
9 and 9 are the pressing pieces constituted by metallicity, for example, brass etc., and the end is soldered to said circuit pattern 2b and 2b.
The structure of the piezoelectric device with which the loudspeaker device of this design is equipped, Since it is constituted as mentioned above, in the composed stage, the undersurface electrode 6 of a piezoelectric device will electrically be connected to the circuit patterns 2a and 2a via the conductive rubbers 3 and 3, and the upper surface electrode 7 will electrically be connected to circuit pattern 2b and 2b via the pressing pieces 9 and 9.
Therefore, by soldering a lead to the circuit patterns 2a and 2a, or extending the circuit pattern 2a and 2b, as illustrated, Although not illustrated, it is connectable with the head amplifier circuit currently formed on this printed circuit board, and as shown in above mentioned Fig. 3, it can attach to the upper surface of the bobbin 14, and the vibration output of a loudspeaker can be taken out.
Since the piezoelectric device is forced on the conductive rubbers 3 and 3 with the pressing pieces 9 and 9, it is as [this] fixable enough, but fixing firmly with adhesives etc. further is preferred.
Fig. 2 shows other working examples of the fixing structure of the piezoelectric device of this device, and Fig. 1 and identical codes show identical parts.
In the case of this working example, the circuit pattern 2a and 2b are formed so that it may conduct mutually, and electric connection is made by another circuit pattern 2c via the short lead from the bipolar electrode 8.
Therefore, since the electrode surface of the upper and [of a piezoelectric device] the

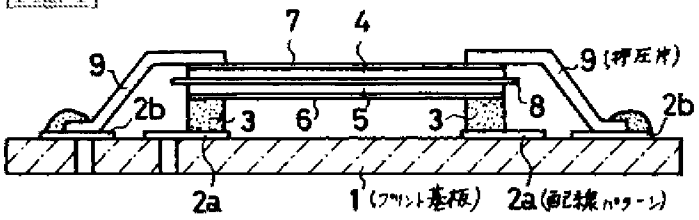
bottom will serve as ground potential if the circuit pattern 2a and 2b are used as a grounding terminal, a shielding effect can be brought to the whole piezoelectric device and the effect of not gathering an inductive noise can be done so.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
The side view showing one working example of the piezoelectric device which attaches Fig. 1 to the loudspeaker device of this device, the side view showing the working example of everything [Fig. 2] but the fixing structure of a piezoelectric device, and Fig. 3 are side views of the conventional loudspeaker device used as the MFB sensor of a piezoelectric device.
Among a figure, as for one, a printed circuit board, 2a, and 2b show a circuit pattern, 3 shows four, and conductive rubber and 5 show a piezoelectric-crystal board and the pressing piece of metallicity [7 / 6 and / 9 / the upper surface and an undersurface electrode, and].

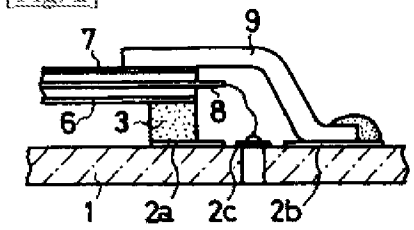
DRAWINGS

[Fig. 1]



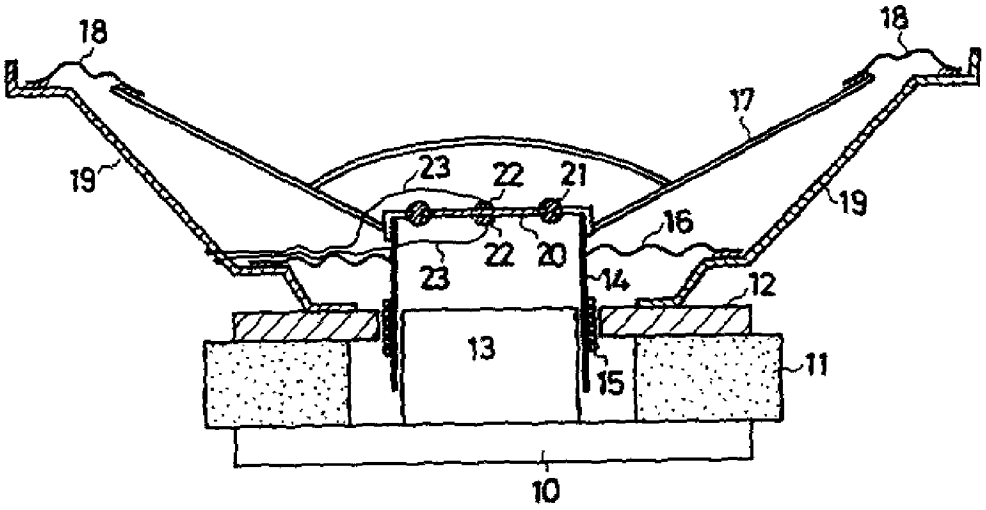
この考案の圧電素子の取付構造図

[Fig. 2]



中間電極を出力端子とする取付構造図

Fig. 3]



MFBセンサを取り付けたスピーカの側面図